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10/056,080	01/28/2002	Shin-ichirou Harasawa	1095.1208	2249

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EXAMINER	
LE, TRAN Q	

ART UNIT	PAPER NUMBER
2633	

DATE MAILED: 02/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/056,080	SHIN-ICHIROU HARASAWA	
	Examiner	Art Unit	
	Tran Q. Le	2633	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 January 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *15-22 and 25-30* is/are allowed.

6)☒ Claim(s) *1,2,5,6,8,10,11,13,14 and 23* is/are rejected.

7)☒ Claim(s) *3,4,7,9,12 and 24* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 January 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *Jan 28,2002*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 2, 5, 11, and 26 are objected to because of the following informalities:

Regarding claim 2, the phrase "excitation light" on p. 2 line 16 should be "an excitation light".

Regarding claim 5, the phrase "which optically multiplexes the excitation light emitted by the more than two excitation light sources" on p. 4, lines 7-9 should be changed to "which optically multiplexes the excitation lights emitted by more than two excitation light sources".

Regarding claim 11, the phrase "excitation light" on p. 8 lines 14-15 should be "an excitation light".

Regarding claim 26, the phrase "excitation light" on p. 19, line 8 should be "an excitation light".

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 8, 23, and 26 recite the limitation "the optical-fiber transmission line" in p. 6, lines 26-27, p. 17, lines 10-11, and p. 19, line 9, respectively. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Terahara (US Patent No. 6,271,945) in view of Bode et al. (US Patent No. 6,212,001).

Regarding claim 1, Terahara discloses an optical transmission system (fig. 17) comprising:

an optical terminal (98, fig. 17);

an optical-fiber transmission line (102A, fig. 17) connected to the optical terminal (98, fig. 17); and

an optical repeater (106, fig. 17) arranged along the optical-fiber transmission line (102A, fig. 17);

the optical terminal includes,

an optical-signal power detection unit (86, fig. 13) which detects power of optical signals (ch. 1...ch.m, fig. 13) transmitted from the optical terminal in each of a plurality of gain bands (col. 12, lines 26-33);

a tone-signal generation unit (88, fig. 13) which generates a plurality of tone signals (f1...fm, fig. 13 and col. 11, lines 49-53) respectively corresponding to the plurality of gain bands (λ1...λm, fig. 13), where each of the plurality of tone signals has a different frequency (f1,...,fm, fig. 13) and a characteristic

corresponding to the power of optical signals in one of the plurality of gain bands corresponding to the each of the plurality of tone signals (col. 12, lines 20-25); and

an optical transmission unit (110, fig. 17) which transmits the plurality of tone signals together with optical signals (fig. 13 and col. 11, lines 61-67 and col. 12, lines 1-4).

Terahara differs from the claimed invention in that he does not teach the optical repeater includes: an optical amplification unit which realizes optical amplification in each of a plurality of gain bands with a gain which is determined based on a control signal, a characteristic-signal generation unit which receives a plurality of tone signals, and generates a plurality of characteristic signals each representing a characteristic of one of the plurality of tone signals, and a gain control unit which compares each of the plurality of characteristic signals with a reference signal and generates the control signal corresponding to each of the plurality of gain bands so as to equalize the gain in the optical amplification in each of the plurality of gain bands.

However, Bode, in the same field of endeavor, teaches the optical repeater includes,

an optical amplification unit (OA, fig. 3) which realizes optical amplification in each of a plurality of gain bands with a gain which is determined based on a control signal (output of C, fig. 3 and col. 4, lines 26-39);

a characteristic-signal generation unit (TD, fig. 3) which receives a plurality of tone signals (T1, T2, and Tx, fig. 1 and 2), and generates a plurality of characteristic signals each representing a characteristic of one of the plurality of tone signals (col. 4, lines 18-25 and 48-52); and

a gain control unit (C, fig. 3) which compares each of the plurality of characteristic signals with a reference signal (col. 4, lines 48-62, obviously, a reference signal must be used to provide a difference of the power levels from the auxiliary signal), and generates the control signal (output of C, fig. 3) corresponding to each of the plurality of gain bands so as to equalize the gain in the optical amplification in each of the plurality of gain bands (col. 4, lines 48-62, gain equalization can be done by adjusting the pump power of the optical amplifier or by using a variable optical attenuator within the optical amplifier). Therefore, it would have been obvious for one ordinary skill in the art at the time the invention was made to provide the optical transmission system of Terahara with an optical repeater such as the one of Bode in order to allow the signal travel to a longer distance and restore the signal strength to a desirable level.

6. Claims 2 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Terahara (US Patent No. 6,271,945) in view of Bode et al. (US Patent No. 6,212,001), and in further view of Onaka (US Patent No. 6,510,000).

Regarding claims 2, the combination of Terahara and Bode discloses all the aspects of claim 1, except fails to teach the optical amplification unit injects

excitation light into the optical-fiber transmission line, which is used as an amplification medium in the optical amplification.

However, Onaka teaches an optical amplification unit (EDFA1, fig. 2) injects excitation light (111-16, fig. 2) into the optical-fiber transmission line (111-1, fig. 2), which is used as an amplification medium in the optical amplification.

Therefore, it would have been obvious for one ordinary skill in the art at the time the invention was made to use an amplification unit such as the one of Onaka in the modified optical transmission system of Terahara and Bode in order to provide amplification for the light transmitting in the amplification medium.

Regarding claim 5, the combination of Terahara, Bode and Onaka further teaches an optical amplification unit (1, fig. 4) includes more than two excitation light sources (81, 82, 85, 86, fig. 4) each of which emits excitation light having a different wavelength ((λ1, λ2, λ3, λ4, fig.4), and the optical transmission system further comprises an optical multiplexing unit (24, fig. 4) which optically multiplexes the excitation light emitted by the more than two excitation light sources.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Terahara (US Patent No. 6,271,945) in view of Bode et al. (US Patent No. 6,212,001), and in further view of Shimomura (US Pub. No. 2004/0114933).

Regarding claim 6, the combination of Terahara and Bode discloses all the aspects of claim 1, except fails to teach a driving control unit which activates and deactivates the optical amplification unit.

However, Shimomura, teaches a driving control unit (300, fig. 1) which activates and deactivates the optical amplification unit (abstract).

Therefore, it would have been obvious for one ordinary skill in the art at the time the invention was made to use a driving control unit such as the one of Shimomura in the modified optical transmission system of Terahara and Bode in order to provide a simple switching effect on the optical amplification unit.

8. Claims 11 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bode et al. (US Patent No. 6,212,001) in view of Onaka et al. (US Patent No. 6,510,000).

Regarding claim 11, Bode discloses all the aspects of claim 10, except fails to teach the optical amplification unit injects excitation light into an optical-fiber transmission line, which is used as an amplification medium in the optical amplification.

However, Onaka teaches an optical amplification unit (EDFA1, fig. 2) injects excitation light (111-16, fig. 2) into an optical-fiber transmission line (111-1, fig. 2), which is used as an amplification medium in the optical amplification.

Therefore, it would have been obvious for one ordinary skill in the art at the time the invention was made to use an amplification unit such as the one of Onaka in the

optical repeater of Terahara in order to provide amplification for the light transmitting in the amplification medium.

Regarding claim 13, the combination of Bode and Onaka further teaches the optical amplification unit (1, fig. 4) includes more than two excitation light sources (81, 82, 85, 86, fig. 4) each of which emits excitation light having a different wavelength (λ1, λ2, λ3, λ4, fig.4), and the optical repeater further comprises an optical multiplexing unit (24, fig. 4) which optically multiplexes the excitation light emitted by the more than two excitation light sources.

9. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bode et al. (US Patent No. 6,212,001) in view of Shimomura et al. (US Pub. No. 2004/0114933).

Regarding claim 14, Bode discloses all the aspects of claim 10, except fails to teach a driving control unit which activates and deactivates the optical amplification unit.

However, Shimomura, teaches a driving control unit (300, fig. 1) which activates and deactivates the optical amplification unit (abstract).

Therefore, it would have been obvious for one ordinary skill in the art at the time the invention was made to use a driving control unit such as the one of Shimomura in the modified optical transmission system of Terahara and Bode in order to provide a simple switching effect on the optical amplification unit.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

11. Claims 8 and 23 are rejected under 35 U.S.C. 102(e) as being anticipated by Terahara (US Patent No. 6,271,945).

Regarding claims 8 and 23, Terahara discloses an optical terminal (98, fig. 17) comprising:

an optical-signal power detection unit (86, fig. 13) which detects power of optical signals (ch. 1...ch.m, fig. 13) transmitted from the optical terminal in each of a plurality of gain bands (col. 12, lines 26-33);

a tone-signal generation unit (88, fig. 13) which generates a plurality of tone signals (f1...fm, fig. 13 and col. 11, lines 49-53) respectively corresponding to the plurality of gain bands (λ1...λm, fig. 13), where each of the plurality of tone signals has a different frequency (f1,...,fm, fig. 13) and a characteristic corresponding to the power of optical signals in one of the plurality of gain bands corresponding to the each of the plurality of tone signals (col. 12, lines 20-25); and

an optical transmission unit (110, fig. 17) which transmits the plurality of tone signals together with optical signals (fig. 13 and col. 11, lines 61-67 and col. 12, lines 1-4) through the optical-fiber transmission line (102, fig. 17).

12. Claim 10 is rejected under 35 U.S.C. 102(e) as being anticipated by Bode et al. (US Patent No. 6,212,001).

Regarding claim 10, Bode discloses an optical repeater (A, fig. 3) comprising:

an optical amplification unit (OA, fig. 3) which realizes optical amplification in each of a plurality of gain bands with a gain which is determined based on a control signal (output of C, fig. 3 and col. 4, lines 26-39);

a characteristic-signal generation unit (TD, fig. 3) which receives a plurality of tone signals (T1, T2, and Tx, fig. 1 and 2), and generates a plurality of characteristic signals each representing a characteristic of one of the plurality of tone signals (col. 4, lines 18-25 and 48-52); and

a gain control unit (C, fig. 3) which compares each of the plurality of characteristic signals with a reference signal (col. 4, lines 48-62, for example, a given threshold or a signal used to determine a difference of the power levels), and generates the control signal (output of C, fig. 3) corresponding to each of the plurality of gain bands so as to equalize the gain in the optical amplification in each of the plurality of gain bands (col. 4, lines 48-62, gain equalization can be done by adjusting the pump power of the optical amplifier or by using a variable optical attenuator within the optical amplifier).

Allowable Subject Matter

13. Claims 3, 4, 7, 9, 12, and 24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Regarding claim 3, the prior art of record still fails to teach specifically the characteristic-signal generation unit comprises, a photoelectric conversion unit which receives the plurality of tone signals, and generates an electric signal representing the plurality of tone signals, a plurality of frequency filters which respectively extract the plurality of tone signals from the electric signal, and a smoothing unit which smoothes the plurality of tone signals extracted by the plurality of frequency filters so as to generate the plurality of characteristic signals.

Regarding claim 7, the prior art of record still fails to teach specifically an optical transmission system comprising: an optical terminal; a plurality of optical-fiber transmission lines connected to the optical terminal; and an optical repeater arranged along the plurality of optical-fiber transmission lines; the optical terminal includes, an optical-signal power detection unit which detects power of optical signals transmitted from the optical terminal in each of a plurality of gain bands through each of the plurality of optical-fiber transmission lines, a tone-signal generation unit which generates a plurality of tone signals respectively corresponding to the plurality of gain bands for each of the plurality of optical-fiber transmission lines, where each of the plurality of tone signals has a different frequency, and each of the plurality of tone signals for each of the plurality of optical-fiber transmission lines has a characteristic corresponding to

the power of optical signals transmitted in one of a plurality of gain bands corresponding to the each of the plurality of tone signals in the each of the plurality of optical-fiber transmission lines, and an optical transmission unit which transmits the plurality of tone signals together with optical signals through each of the plurality of optical-fiber transmission lines; the optical repeater includes, an optical amplification unit which realizes optical amplification in each of the plurality of gain bands with a gain which is determined based on a control signal, a characteristic-signal generation unit which receives the plurality of tone signals from each of the plurality of optical-fiber transmission lines, and generates a plurality of characteristic signals each representing the characteristic of one of the plurality of tone signals received from each of the plurality of optical-fiber transmission lines, an averaging unit which obtains for each of the plurality of gain bands an average of ones of the plurality of characteristic signals corresponding to both of the plurality of optical-fiber transmission lines and the each of the plurality of gain bands, and a gain control unit which compares the average with a reference signal, and generates the control signal for each of the plurality of gain bands so as to equalize the gain in the optical amplification in each of the plurality of gain bands.

Regarding claim 9, the prior art of record still fails to teach specifically the characteristic of each of the plurality of tone signals is the frequency of the each of the plurality of tone signals or a modulation depth with which the each of the plurality of tone signals is modulated, the tone-signal generation unit decreases the modulation depth of one of the plurality of tone signals or increases a difference between a predetermined

frequency and the frequency of the one of the plurality of tone signals in order to increase a gain in optical amplification in one of the plurality of gain bands corresponding to the one of the plurality of tone signals, and the tone-signal generation unit increases the modulation depth of one of the plurality of tone signals or decreases a difference between the predetermined frequency and the frequency of the one of the plurality of tone-signals in order to decrease a gain in optical amplification in one of the plurality of gain bands corresponding to the one of the plurality of tone signals.

Regarding claim 12, the prior art of record still fails to teach specifically the characteristic-signal generation unit comprises, a photoelectric conversion unit which receives the plurality of tone signals, and generates an electric signal representing the plurality of tone signals, a plurality of frequency filters which respectively extract the plurality of tone signals from the electric signal, and a smoothing unit which smoothes the plurality of tone signals extracted by the plurality of frequency filters so as to generate the plurality of characteristic signals.

Regarding claim 24, the prior art of record still fails to teach specifically the characteristic of each of the plurality of tone signals is the frequency of the each of the plurality of tone signals or a modulation depth with which the each of the plurality of tone signals is modulated, the tone-signal generation unit decreases the modulation depth of one of the plurality of tone signals or increases a difference between a predetermined frequency and the frequency of the one of the plurality of tone signals in order to increase a gain in optical amplification in one of the plurality of gain bands corresponding to the one of the plurality of tone signals, and the tone-signal generation

unit increases the modulation depth of one of the plurality of tone signals or decreases a difference between the predetermined frequency and the frequency of the one of the plurality of tone signals in order to decrease a gain in optical amplification in one of the plurality of gain bands corresponding to the one of the plurality of tone signals.

14. Claims 15-22, 25-30 are allowed.

15. The following is an examiner's statement of reasons for allowance: claims 15-22, and 25-30 are allowable because the prior art does not teach or fairly suggest the following:

an optical transmission system comprising: an optical terminal; a plurality of optical-fiber transmission lines connected to the optical terminal; and an optical repeater arranged along the plurality of optical-fiber transmission lines; the optical terminal includes, an optical-signal power detection unit which detects power of optical signals transmitted from the optical terminal in each of a plurality of gain bands through each of the plurality of optical-fiber transmission lines, a tone-signal generation unit which generates a plurality of tone signals respectively corresponding to the plurality of gain bands for each of the plurality of optical-fiber transmission lines, where each of the plurality of tone signals has a different frequency, and each of the plurality of tone signals for each of the plurality of optical-fiber transmission lines has a characteristic corresponding to the power of optical signals transmitted in one of a plurality of gain bands corresponding to the each of the plurality of tone signals in the each of the plurality of optical-fiber transmission lines, and an optical transmission unit which

transmits the plurality of tone signals together with optical signals through each of the plurality of optical-fiber transmission lines; the optical repeater includes, a first optical amplification unit which realizes optical amplification in a first one of the plurality of gain bands in each of the plurality of optical-fiber transmission lines with constant light emission, a second optical amplification unit which realizes optical amplification in each of the plurality of gain bands except for the first one of the plurality of gain bands in each of the plurality of optical-fiber transmission lines, with a gain which is determined based on a control signal, a characteristic-signal generation unit which receives the plurality of tone signals from each of the plurality of optical-fiber transmission lines, and generates a plurality of characteristic signals each representing the characteristic of one of the plurality of tone signals received from each of the plurality of optical-fiber transmission lines, an averaging unit which obtains for each of the plurality of gain bands an average of ones of the plurality of characteristic signals corresponding to both of the plurality of optical-fiber transmission lines and the each of the plurality of gain bands, and a gain control unit which compares the average obtained for each of the plurality of gain bands except for the first one of the plurality of gain bands, with a reference signal, and generates the control signal for each of the plurality of gain bands except for the first one of the plurality of gain bands so as to equalize the gain in the optical amplification in each of the plurality of gain bands, where the reference signal is the average obtained for the first one of the plurality of gain bands.

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kinoshita (US Patent No. 6,259,553) is cited to show an optical communication system having a transmitting station for outputting WDM signal light, an optical fiber transmission line, a receiving station, and an optical repeater including an optical amplifier.

Onaka et al. (US Patent No. 5,894,362) is cited to show an optical communication system which determines the spectrum of a wavelength division multiplexed signal and performs various processes in accordance with the determined spectrum.

Terahara (US Patent No. 6,219,176) is cited to show a method for gain equalizing, and device and system for use in carrying out the method.

Fishman (US Patent No. 5,654,816) is cited to show performing monitoring of optical amplifiers, and an apparatus and method for detecting a power level of a tone modulated upon a signal input to the amplifier.

Conclusion

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tran Q. Le whose telephone number is (571)272-2046. The examiner can normally be reached on 8am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on (571)272-3022. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TQL

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